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AUTHOR Curtis, Mary E.; And Others
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ABSTRACT

Two studies examined the relationship between word knowledge and reading comprehension. Subjects were college undergraduates with high and low verbal abilities as indicated by a standardized verbal aptitude test. The first study involved a multiple choice vocabulary test from which words that both groups defined correctly were selected. The subjects were then asked to use the words in sentences, define their meanings, and make semantic comparisons among them. The results indicated that low verbal subjects' knowledge of word meaning was less complete and more bound to a specific context than that of high verbal subjects. The second study investigated this possibility with a combined protocol and reaction time methodology. Subjects read two paragraphs--one using a word in a familiar context, the other in an unfamiliar context--and were asked to define the word. The second study indicated that the completeness of knowledge about the meaning of a word that is familiar seems to affect both sentence reading time and paragraph recall (although the former more so for the high verbals and the latter more so for the low verbals). The results suggest that, although it may be a relatively straightforward task to teach a connection between an "unknown" word and a "known" word, it is a much more complex matter to provide and promote the decontextualized knowledge that will facilitate the comprehension of those words in an unfamiliar text. (HTH)

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Word Knowledge Influences on Comprehension

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Mary E. Curtis

Graduate School of Education
Harvard University

James M. Collins, Drew H. Gitomer & Robert Glaser

Learning Research and Development Center
University of Pittsburgh

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ABSTRACT

A major aspect of skill in discourse comprehension involves knowledge of word meanings. Additionally, vocabulary knowledge is one of the best single indicators of verbal intelligence. Apart from this correlational evidence, however, the influence of word knowledge on text comprehension is poorly understood. The purpose of the present studies was to examine more closely the relationship between word knowledge and comprehension. In particular, the objectives were to (a) characterize differences in word knowledge between high and low vocabulary test scorers, and (b) demonstrate how these differences affect comprehension of what is read.

The first study indicated that low verbals' knowledge of word meanings is more often less complete, and bound to specific contexts, than that of high verbals. The second study indicated that the completeness of knowledge about the meaning of a word that is familiar seems to affect both sentence reading time and paragraph recall (although the former more so for the high verbals and the latter more so for the low verbals.) Implications of these results for vocabulary tests and instructional efforts to improve comprehension through vocabulary training are discussed.

We would like to focus, in this paper, on two issues that are related to individual differences in word knowledge and comprehension. The first issue has to do with understanding the differences in semantic knowledge that underlie differences in scores on standardized vocabulary tests. The second issue has to do with understanding how these differences in semantic knowledge can facilitate or retard the acquisition and understanding of new information.

Concern with the role that word knowledge plays in comprehension and learning is not a new one. It has long been known that vocabulary knowledge is one of the best single predictors of success in school (Carroll, 1971; Terman, 1918), and that vocabulary is a major factor in reading comprehension (Davis, 1968). Apart from this correlational evidence, however, the relationship between knowledge of word meanings and skill in comprehension and learning is not very well understood. Rather than comparing relationships among test scores, we have compared the knowledge and processing of high and low verbal adults in ways that we think can lead to a better understanding of the relationship between vocabulary and comprehension.

The high and low verbal adults in our studies were college undergraduates, and we selected them on the basis of their scores on the Verbal Scholastic Aptitude Test (VSAT). The low verbals' scores were around 400, the high verbals' scores were close to 600 or above (Means and SDs: Study 1 -- 386 (67) and 599 (58); Study 2 -- 404 (28) and 661 (44)). Thus, although our students are drawn from a relatively "skilled" population, there was a sizable difference in their scores,

and as our studies indicate, also in their knowledge of word meanings.

Our first study involved two phases. In the first phase, a multiple choice vocabulary test, composed of items from several standardized tests, was administered to both groups of students. Based on the results of this test, sets of words were selected for use in the second phase of the study. One set of words was selected from the items that both the high and low verbals answered correctly on the test; another set was selected from the items that only the high group answered correctly.

Our goal in the second phase of the study was to examine the differences between the verbal ability groups on each of the sets of words. We did this by conducting "interviews" with the individual students, in which we asked them to: (a) use the words from the items in sentences; (b) define the meanings of the words; and (c) make semantic comparisons among the words that made up a given item on the vocabulary test.

Several interesting differences emerged between the groups of students and between the sets of items when we analyzed this protocol data. Initially, we used used two categories to score the definitions that the students gave for the words. In the first category -- "unknown"-- the definitions were either incorrect (e.g., "vacillation probably means the same as vaccination") or the students were unable to define the words. The second category -- "known" -- consisted of definitions that included some type of accurate semantic information about the words. Not too surprisingly, the number of words with which

individuals were familiar was highly correlated with Verbal SAT scores ($r = .92$), indicating that the low verbal students did not have any accurate semantic information about many of the words on the test.

We then made comparisons among the definitions that the high and low verbal students had generated for the "known" words, i.e., the words about which they had some accurate semantic information. When this was done, we found that low verbals' definitions tended more often than high verbals (20% vs. 10%, $p < .0001$) to be tied to the specific contexts in which the words usually occur. For example, asked to define surveillance, one student said that "surveillance is what the police do in crime situations". High verbals, on the other hand, tended more often than low verbals (67% vs. 52%, $p < .0001$) to give definitions that considered the words' meaning apart from specific contexts in which they usually occur (e.g., "surveillance means to watch").

Although variation in vocabulary test scores was correlated with this difference in the level of "completeness" of word knowledge, i.e. context-bound vs. a decontextualized knowledge of the word, items that were the best discriminators between high and low vocabulary scorers were not the items that were sensitive to this difference. Instead, the discriminating items distinguished between high and low verbal students because the high verbal students were familiar with some aspect of the meaning of the words while the low verbals were not.

We draw two conclusions from this study. The first conclusion relates to the way that vocabulary knowledge is tested. What vocabulary tests seem to do very well (as indicated by the discriminating items -- the items that make the tests "work") is measure differences between no knowledge and some knowledge about the meaning of words. However, what they do not do very well is make apparent a potentially useful distinction between "partial" and "complete" knowledge of words' meanings. Although both low and high verbals correctly answer vocabulary items about which they have some knowledge, the level of knowledge about the word is quite different for the two ability groups.

The second conclusion that we draw from this study concerns the relationship between vocabulary knowledge and skill in comprehension. Certainly whether or not a word is "known" can affect comprehension. Texts that contain many words whose meanings are unknown are poorly comprehended (e.g., Freebody & Anderson, 1981). Probably of equal importance to success in comprehension, however, is the precision and richness of semantic information that is associated with words whose meanings are familiar to the reader. The data from the interview task indicated that low verbal's knowledge of word meaning is often less complete, and bound to a specific context, than that of high verbals. As such, their comprehension may often be less complete, even when a task contains words about which they have some knowledge.

We investigated this possibility in a second study, using a combined protocol and reaction time methodology. Two paragraphs were constructed for each of 24 words in such a way that, in one paragraph,

the word appeared in a familiar context, while in the other paragraph, the word appeared in a less familiar context. For example, as shown in Figure 1, the target word surveillance appeared in a familiar context of police detectives watching the activities of some suspects, and in a less familiar context of wildlife officials watching the activities of some eagles. In both cases, the concluding sentence was "This surveillance lasted about two weeks". Contextual knowledge of the word is likely to be very consistent with the familiar context, and therefore should facilitate some comprehension. However, this contextual knowledge would be of little help in comprehending the word in the less familiar context. Instead, decontextualized knowledge would be necessary for comprehension.

High and low verbal adults were again the subjects in the study, and some of the measures that were used to assess the relationship between word knowledge and comprehension are summarized in Table 1.

Although we expected that college students would have at least partial knowledge about the words that we had selected, we wanted to make sure that this was the case. So, following the procedure of the first study, we asked the students to first define the words. As can be seen in Table 2, there was a difference between the skill groups in the number of words about which they had at least a contextualized knowledge of the meaning. On the average, low verbals had at least contextual knowledge of 70% of the words; high verbals had at least contextual knowledge of 90% of the words. Also, as we found in Study 1, the skill groups differed in the completeness of the knowledge they had about the

meanings of words with which they were familiar. The low verbal group again had less decontextualized knowledge about the words whose meanings that they "knew".

The remaining measures described in Table 1 are based on the results from the paragraph reading task. In this task, each paragraph, followed by its target sentence, was presented separately on slides. Students were told to read each as they would normally, and were informed that they would later be asked to recall what they had read. In addition, students were instructed to push a button after they had finished reading each piece of text, and their reading times were recorded via a microcomputer.

While the high verbal subjects did read the paragraphs faster than did the low verbal subjects, neither group showed a difference in the reading times for the familiar context paragraphs and the less familiar context paragraphs.

The mean reading times for the target sentences are contained in Table 3. Since the sentences were the same in each of the conditions (i.e. only the content that preceded them differed), we can compare the reading times between the conditions for each of the skill groups. Notice that for the high verbals, there is more than a one second difference between the reading times for the familiar context and less familiar context conditions. This result is consistent with many other experimental studies of on-line processing during reading (e.g. Haviland & Clark, 1974; Lesgold, Roth & Curtis, 1979). That is, when knowledge about a word's meaning was consistent with a passage's content

(as it was in the familiar context), understanding a sentence that contained that word was a relatively efficient process.

However when knowledge about a word's meaning did not match the previous content, sentence processing was slowed down. Now compare these times to those of the low verbal students. Although slower in both of the conditions, the difference between conditions was not as large for the low verbals as it was for the high. Since the difference between number of familiar words and number of precise definitions was larger for the low verbals than for the high group, it seems unlikely that the differential ease of comprehension for the paragraph types was not as large for the low group. Instead, it appears that the low group may have been less aware of, or concerned with, the inconsistency between the paragraph context and their knowledge of the target word. (Other data in this study suggest a similar conclusion.)

The next three measures described in Table 1 are measures that are based on recall of the paragraphs. In the recall task, students were first shown each of the 24 target words and asked to recall the passage that contained them (e.g. Tell me about the paragraph that contained surveillance). The third row of means in Table 3 indicates that the skill group and condition differences in the number of paragraphs that were recalled. If students were unable to recall a paragraph in response to the target word they were shown a second cue that related to the paragraph content (e.g. police or wildlife officials). The second cue improved recall in all conditions, although there was still a difference between paragraph types for the low verbal group (88% vs.

79%). Finally, in those cases when students recalled something about the content of a paragraph, they were also asked to recall what the meaning of the target word had been in the paragraph. The results for this variable are shown in the last line of Table 3. Note that for one half of the passages recalled in the less familiar context condition, the low verbals either incorrectly recalled, or could not recall at all, the way that the target word cue had been used. Again, this suggests that the low verbal groups was less likely to integrate the target sentence into their memory for the passage content.

What do these results tell us about the influence of word knowledge on comprehension? First, the completeness or precision of knowledge about the meaning of a word that is familiar seems to affect both sentence reading time and paragraph recall (although the former more so for high verbals and the latter more so for low verbals). Thus, ease of comprehension and memory for what has been read are influenced by word knowledge. Second, low verbal individuals appear to have two disadvantages during comprehension: they have less decontextualized knowledge about the meanings of words that they "know", and they appear to ignore the demands for semantic integration in comprehension and learning, perhaps as a function of a lack of attentional or knowledge resources. And finally, we believe that these studies have implications for instructional efforts to improve comprehension through vocabulary training. Our results suggest that, although it may be a relatively straightforward task to teach a connection between an "unknown" word and a "known" one, it is a much more complex matter to provide and promote the decontextualized knowledge that will facilitate the comprehension of

those words in a text.

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Curtis, M.E. Harvard University
Collins, J.M., Gitomer, D.H. & Glaser, R.
University of Pittsburgh

Two men were arrested yesterday after they led detectives to a warehouse containing stolen goods. The arrests were the result of information given by an anonymous phone caller. After receiving the tip, police watched the whereabouts of the men very closely.

-PARAGRAPH-

State wildlife officials have been successful in their adoption plan for a laboratory-born eagle. The baby was introduced into the nest of adult eagles with the hope that they would accept it. After placing the chick, the officials watched the actions of the adults very closely.

This surveillance lasted about two weeks. -TARGET SENTENCE- This surveillance lasted about two weeks.

Figure 1. Sample paragraph and target sentence from the Familiar Context Condition (left) and the Less Familiar Context Condition (right).

Curtis, M.E. Harvard University
Collins, J.M., Gitomer, D.H. & Glaser, R.
University of Pittsburgh

TABLE 1

Summary of Variables and Measures

Familiar Context Condition: contextual knowledge of meaning sufficient
Less Familiar Context Condition: decontextual knowledge of meaning required

(a) Word Knowledge: based on definitions generated prior to reading
(b) Sentence RT: reading time for target sentences
(c) Paragraph Recall -- Word Cue: percentage of paragraphs recalled in response to target word
(d) Paragraph Recall -- Content Cue: percentage of paragraphs recalled in response to content word(s)
(e) Word Meaning in Context: conditional on paragraph recall -- recall of target word meaning

TABLE 2

Summary of Subjects' Word Knowledge

Level of Knowledge	Low Verbals	High Verbals
At Least Contextual	71%	93%
Decontextual	31%	63%

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University of Pittsburgh

TABLE 3

Summary of Results

	Low Verbals (N=14)		High Verbals (N=14)	
	Familiar Context	Less Familiar Context	Familiar Context	Less Familiar Context
Sentence RT	4.1 sec.	4.5 sec.	3.1 sec.	4.2 sec.
PR -- Word Cue	62%	41%	85%	62%
PR -- Content Cue	88%	79%	95%	95%
Word Meaning	74%	51%	94%	85%